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THE SCIENCE OF BACTERIOLOGY.

The Principles of Bacteriology. By Dr. Ferdinand Hueppe. Authorised translation from the German by Dr. E. O. Jordan. Pp. x+467. (Chicago: The Open Court Publishing Company. London: Kegan Paul, Trench, Trübner and Co., Ltd., 1899.)

IN order to fully appreciate the aim and object of the talented author of this work, it is necessary to quote a few passages from his preface. Prof. Hueppe points out that the natural history side of bacteriology has in the past been kept too much in the foreground, while the scientific side has been relegated almost exclusively to the sections dealing with protective inoculations.

"This mode of treatment," continues the author, "no longer suffices to meet a growing and legitimate demand. In this book I wish to present an attempt at a critical and comprehensive exposition of bacteriology, basing it clearly and solidly upon scientific conceptions. I make this essay in order that our knowledge of the causes of putrefaction, fermentation and disease, together with the methods of the prevention and cure of infection, may develop in a way free from all ontology. It is sometimes of use to restate things which are axiomatic. The 'entities' or 'essences,' which, even in the age which has discovered the law of the conservation of energy and the evolution of living things by means of the struggle for existence, still haunt the mind of the physician who remains sunk in the ontological contemplation of diseased cells and disease-producing bacteria, are a mere remnant of priest medicine, and can have no place in any scientific conception of biology, pathology or hygiene."

The first chapter (pp. 1-49) in the book deals with "The structure of bacteria." No greater authority on this subject than the author could be named; yet, in view of the highly important questions discussed in Chapters iv.-vii., one is led to doubt whether this portion of the book is not a little out of keeping with the scope of the work as a whole.

The "Vital phenomena of bacteria" are discussed in Chapter ii. (pp. 50-138). Although the subject is most ably dealt with, most of the information given may be found in nearly every text-book of bacteriology. Considering the important character of the rest of the book, this chapter seems unduly long.

In Chapter iii. (pp. 146-219) a brief description of the most important pathogenic bacteria is given. Here the author paves the way for the discussion of the important questions which crop up later in the book. It is curious to note that Prof. Hueppe, although considering that the evidence is most in favour of *B. typhosus* and *B. coli communis* being two distinct species, is by no means dogmatic on the point. Thus he says, on p. 193:—

"There are, in fact, at present two opposing views. The one, which to me seems to be the better founded, is that the bacteria of typhoid fever and *B. coli communis* are two distinct species. The other view is that the common intestinal saphrophyte, *B. coli communis*, is an æco-parasite which, under special conditions, may become able to invade the body and penetrate into the living organism, where it undergoes transformation into the typhoid bacterium."

At the end of this chapter Mr. Jordan contributes a brief *résumé* of Sanarelli's recent papers upon yellow fever. The summary is concisely and well written, and enables one to comprehend without difficulty the extent and value of Sanarelli's researches. The remaining chapters are full of originality, and invite most careful reading and serious attention.

In Chapter iv. (pp. 221-274) the "Cause of infectious disease" is discussed with conspicuous ability. The author endeavours to show what is false and what is scientifically tenable in the different conceptions of the true and sufficient cause of epidemic disease upheld by such authorities as Koch, Virchow and Pettenkoffer.

"Virchow finds an internal cause in the diseased cells; his opponents see an external cause in the germs that bring about the disease; and Pettenkoffer sees a cause in those external conditions which play no particular rôle either in the eyes of Virchow or in those of Virchow's chief opponents."

If the writer does not altogether succeed in his object, he at all events widens our horizon of thought to an extent which is quite remarkable. It will not be out of place to quote a single paragraph—

"If the facts are considered in a scientific spirit rigorously and without prepossession, it is seen that the sum of the qualities of a disease germ is only apparently the 'essence' of an infectious disease, that, in reality, here as elsewhere, a true internal cause is to be found, inherent in the internal organisation of man. Just as in all natural processes, without exception, so here, the disease germs act as liberating impulses, and are able to set free only what in the form of a predisposition toward disease is in some way prefigured both in nature and amount in the human body."

In Chapter v. (pp. 275-294) the author asks the question—"Can disease be cured by combating the cause?"

In speaking of Hahnemann's doctrine of the value of small doses, the author passes the following criticism on homœopathy:—

"Even the childish extravagance which found vent in homœopathy could not impair the sound kernel of truth which the doctrine contained."

Although Prof. Hueppe's whole book ought to be read by all those physicians who are modest enough (happily, the great majority) to believe that there is something still to be learnt in the theory and practice of medicine, this chapter is especially full of suggestions and original observations, which the thoughtful practitioner would do well to study.

Chapter vi. (pp. 295-397) treats of "Immunity, protective inoculation, and curative inoculation." It is, perhaps, the most important chapter in the book, and it is impossible in the limits of this notice to do the author full justice. It may, however, be said that it deals with a most difficult and complex subject in a way that is to be highly commended. That it is "stiff" reading cannot be denied, but that is not the fault of the writer, but of the subject. A careful perusal of this portion of the book will well repay the physician as well as the bacteriologist.

The "Prevention of infectious diseases by combating the cause of the disease" is the text of Chapter vii. (pp. 398-439). Here we are not altogether in sympathy with the writer, although his views are clearly and forcibly

expressed, and are in the main in touch with the teachings of modern sanitarians.

It is to be regretted that in this chapter the author allows his personal antagonism to Koch's doctrine of disinfection to weaken his arguments and conclusions. That the followers of Koch sometimes carried disinfection too far does not detract from the value of Koch's original observations.

Prof. Hueppe lays peculiar stress on the importance of making infectious disease impossible by removing the predisposition to disease, but he scoffs at the idea of combating disease by warring directly with the germs of disease. Although there is a great deal to be learnt from this chapter, it seems a pity that so able a writer should have marred his own work by a captious criticism of Koch's able investigations.

The last chapter (pp. 440-455) deals with the "History of Bacteriology." Ably written though it is, it, like the first chapter, appears to be foreign to the general scope of the book.

In summary of the book as a whole, it may be said that it affords more ground for serious thought and reflection than perhaps any of the works on bacteriology hitherto published. The original and able manner in which the author attacks biological problems of great difficulty and complexity deserves all praise, and we can cordially recommend the book, not only to bacteriologists pure and simple, but also to those physicians who recognize the limitations of medical science.

Much praise is due to the translator. Mr. Jordan's worth as a bacteriologist is well known and fully appreciated. By giving us this translation of Hueppe's work he has added to his reputation. A. C. HOUSTON.

SUNSHINE AND WINE-GROWING.

Vinification dans les Pays chauds—Algérie et Tunisie.

Par J. Dugast. Pp. 281 ; 58 figures. (Paris : Carré et C. Naud, 1900.)

ACCORDING to the preface, valuable scientific and technical works on the production of wine in temperate climates have been published both in France and elsewhere ; but so far the special problems which are encountered by wine-growers in the warm climates of such countries as Algeria and Tunis have remained unnoticed. The present work is intended by the author to fill this blank. But although it has been written specially with a view to describe the difficulties peculiar to wine-making in a warm climate and the means of overcoming them, the author has done more than this, for he has found it advisable, in order to make his purpose quite clear, to embody his special subject in a general scientific and technical description of wine-making. As he has had very considerable practical and scientific experience in his subject, the result is a work well worth the attention of all interested in the making of wine.

The most common difficulty of the Algerian wine-grower, and one which is very rare in the more temperate climate of France, is due to the must, or grape juice, very frequently containing too little acid and too much sugar as a result of very active plant assimilation induced by excessive solar radiation. Deficiency of acid is apt

not only to affect injuriously the flavour of the resulting wine, but also to induce unsoundness ; the latter effect being caused by the low acidity of the wine favouring the growth of injurious bacteria, which the higher acidity of a normal wine tends to inhibit, owing to the well-known fact that an acid medium is unfavourable to the development of most ferment bacteria.

The means employed to remove the difficulty of want of acidity, which are described by the author, let us into secrets of wine-making which some may perhaps be inclined to think border on sophistication. Plastering is one which is undoubtedly objectionable. It consists in adding calcium sulphate to the crushed grapes, which results in the formation, from the cream of tartar present in the must, of sulphate of potash. But this method, though evidently made use of by many wine-growers, is condemned by the author, and also discouraged by the French law, which limits the amount of sulphate of potash to two grammes per litre.

Other methods for increasing the acidity of the must are : crushing a certain quantity of unripe sour grapes with the ripe ones ; the addition of tartaric acid to the must previous to fermentation ; and sprinkling the grapes in the wine-press with, what the author styles, di-calcic phosphate. The latter treatment is said to result in the formation of acid phosphate of potash, a salt considered by the author to be less objectionable than sulphate of potash.

Excess sugar in the must acts detrimentally by throwing too much work on the yeast, which is itself apt to be crippled in the hot climate of Algeria by an exceedingly high fermentation temperature. Mention is made of the fermentation temperature at times rising to upwards of 115° F.—which in itself is sufficient to arrest the fermentation functions of most yeasts.

About 20 per cent. of sugar is considered the most favourable amount for a wine must to contain, and if the saccharometer shows that it exceeds this amount, the best remedy appears to be the simple and inexpensive use of the pump.

An interesting point, about which much has been said of late years, is raised by the author when he deals with the question of the use of pure selected yeasts in the fermentation of wine. It has been advanced by certain upholders of this system that the characteristic flavour or bouquet of most well-known wines is produced in the main by the variety or species of yeast natural to the grapes of the district, and that, if pure cultures of such yeasts are made use of in the fermentation of foreign musts, the flavour of the resulting wines assume the character of the wines of the district from which the yeasts were obtained.

The idea is evidently one of the greatest importance to the wine industry, as it holds out hopes of improving the wine of poor districts into something like, let us say, first quality clarets or Burgundies. The author of this book states that selected yeasts have been much used by the wine-growers of Algeria, and he claims to have had ample opportunities for studying the results. The conclusion he arrives at is that the yeast from a noted growth of wine, when added to an ordinary must, is quite powerless to confer on it the special qualities of the wine from which it comes ; and he further concludes